

1 approximately half or perhaps more than half of  
2 the pairings were nonstandard in the microwave.

3 So let me start off with Jeff and ask  
4 really what are the implications, for example, for  
5 blocking the PCS? Why is that kind of a, say, 80  
6 megahertz or 50 important in terms of our own  
7 allocation decisions?

8 MR. ROSENBLATT: Well, what happens is it  
9 all ends up relating to negotiations, and as it  
10 exists in the rules, you're required to have an 80  
11 megahertz separation between your transmit and  
12 receive. That coincides very nicely with the  
13 allocation that the FCC has recently made in the  
14 NPRM.

15 When there are violations to that, as they  
16 currently exist, and the market and microwave  
17 paths are separated by anywhere from 40 to 120  
18 megahertz, then what happens is you've got one end  
19 in your block and one end in someone else's block,  
20 and then it just comes to a matter of who pays,  
21 who negotiates and that increases the complexity,  
22 which increases the time of the whole relocation

1 process.

2           So that is one instance of how the  
3 negotiations becomes more complicated and then  
4 extends out the timing of that relocation.

5           MR. HALLER: Does that mean that the  
6 Commission then need not consider that factor in  
7 terms -- you know, if there is so many variables  
8 out there, then should our discussions be based on  
9 other parameters as opposed to the relocation  
10 issue? In terms of blocks --

11           MR. PEPPER: Or alternatively does that  
12 become such a major issue that that should be  
13 driving all our other decisions? In other words,  
14 where does this fit in in terms of how we should  
15 be thinking about the band plan?

16           MR. ROSENBLATT: Well, again as Comsearch's  
17 role in this is to identify and evaluate some of  
18 the technical issues that are involved with this.  
19 In terms of how we choose to weigh all of the  
20 different factors, I think will in large part be  
21 due to the timing that particular PCS operators  
22 want to go online and other areas. In terms of

1 the technical aspect of it, you know, it's fine  
2 with us any way you cut it.

3 MR. PEPPER: That actually wasn't -- the  
4 question I think -- you, for example, had  
5 mentioned that there is 12,000 paths at the end of  
6 the day that might need to be moved but maybe  
7 not. Have you done any work that would estimate  
8 how many would need to be moved initially so that  
9 service could begin as rapidly as possible, A; and  
10 B, what that timing would be, because you said  
11 last year we licensed 350, and I assume that meant  
12 there were a certain number of engineers in the  
13 industry that were preparing applications for 350  
14 licenses.

15 You know, to what extent is the industry  
16 geared up and ready to do the engineering, make  
17 the applications for how many thousands? And I  
18 think Sandy wants to say something about that as  
19 well but I would be interested to first hear your  
20 response, Jeff.

21 MR. ROSENBLATT: Sure. With regard to  
22 that, that particular question, the answer to that

1 actually is very dependent on the block  
2 allocation. And as I indicated earlier, broader  
3 spectrum allocations require less movement  
4 immediately as opposed to a narrower band  
5 allocation will require everything to move in a  
6 much more rapid fashion.

7           However, the ability for the industry to  
8 handle that could be very significant. And that  
9 example that I indicated earlier is that while the  
10 6.7 gigahertz band is not the only band that was  
11 putting in microwave and certainly not the only  
12 equipment that the microwave community was  
13 manufacturing, it does illustrate that this  
14 particular industry that was -- and all the  
15 associated parties with that industry, whether  
16 you're talking about coordinate, manufacturers,  
17 negotiators and so on, set up to handle something  
18 in the order of 350 or some microwave paths per  
19 year.

20           Now if you're going to ask for somewhere  
21 between 4 and 12,000 microwave paths to relocate  
22 in a very rapid fashion, at this point, leaving

1     aside the negotiation process, the industry  
2     gearing up for that is going to be very extensive  
3     and somewhat time consuming for all of that to  
4     happen.

5             Did that answer your question?

6             MR. PEPPER: It begins to. Sandy.

7             MS. ABRAMSON: I just wanted to point out  
8     that the band plan where we see the 80 megahertz  
9     offset, UTAM has done a lot of analysis to see  
10    where the transceivers and receivers that are in  
11    the band that's allocated for unlicensed where  
12    they're paired, and we see that as just the 80  
13    megahertz rule of thumb really doesn't work here,  
14    and then the band pairings are really all over the  
15    place. But we see that as an advantage to UTAM  
16    because what that means is that the links that are  
17    in the unlicensed bands are paired with the links  
18    that are in the licensed band.

19            So what that means is that when the  
20    licensees are out there and they have to move  
21    their links, what they'll be doing is they'll be  
22    moving links that are in the licensed band as well

1 as the unlicensed band. And we see this is as one  
2 way to expedite movement of the links in the  
3 unlicensed band.

4 MR. PEPPER: If I could just go back for  
5 one second to a point that Jeff raised, I think --  
6 is it correct to interpret what you're saying as  
7 timing is important because of the number of links  
8 that ultimately have to be moved and that the  
9 extent to which service can begin with moving  
10 fewer links and, therefore, the ability to spread  
11 the time of the move over a longer period will  
12 make the move easier; is that what you're saying?

13 MR. ROSENBLATT: That's correct. That's  
14 correct. Having a broader bandwidth for initial  
15 allocation will require less movements in the  
16 preinitiation of service, which would allow you to  
17 get some spectrum to get started to provide some  
18 service. And maybe you would have to relocate  
19 some but not all of your microwave paths, which  
20 you could probably do.

21 If you force everybody to relocate everyone  
22 at one time, it's going to be a significant

1 challenge for everybody to get everybody moved in  
2 a timely fashion. And then your service -- you're  
3 ability to provide service may be very dependent  
4 on that particular issue.

5 MR. STANLEY: Lex, did you want to  
6 comment? You had your hand up.

7 MR. FELKER: Yes. Just a couple of  
8 comments. First of all, I can't emphasize too  
9 strongly this kind of market issue in terms of the  
10 viability of new PCS operators. It's very  
11 important to get up and running as soon as  
12 possible. The windows closing, at least that's  
13 our view, and things that start pushing off  
14 initiation of service three, four, five years make  
15 the business a lot less attractive.

16 I think -- correct me if I'm wrong, Jeff --  
17 the 80 megahertz spacing, while it's not adhered  
18 to exclusively is nevertheless the predominant  
19 spacing in the lower band and, therefore, if  
20 you're looking for sort of techniques to minimize  
21 the microwave problem, at least marginally,  
22 perhaps staying with an 80-meg spacing makes a lot

1 of sense.

2 One other issue in terms of things the  
3 Commission might want to think about to sort of  
4 assist in the microwave process, beyond those  
5 things that you've already done, is to consider  
6 the possibility of relocating or coordinating on  
7 paper all of the links right now, or in short  
8 order, and so that they have a reservation at the  
9 6-gig band that they can take advantage of in the  
10 future. Because if you try to sort of do these  
11 things piecemeal, the likelihood that you're going  
12 to optimally coordinate all these links is less  
13 than if you do it all at once.

14 So that might require some rule change to  
15 allow for coordinative links to sort of stay in  
16 effect for some period of time rather than the six  
17 months or whatever is typical now.

18 MR. STANLEY: Again, not to pick on Jeff  
19 again but I guess one statistic you cited was a  
20 little on the depressing side, and I guess that's  
21 the very wide bandwidth of the receivers. I think  
22 that's been -- to compare this to what was



1 considered in prior studies, APC study for  
2 example, it's quite a bit different. You know,  
3 the direct implication of the report says that  
4 there might not be a lot of spectrum, just in the  
5 time frame that Lex just referred to. That really  
6 suggests the strong possibility of delayed  
7 service.

8 MR. ROSENBLATT: That's correct, and  
9 certainly the impact would be much more  
10 significant in some markets than others, and  
11 additionally in some blocks as opposed to other  
12 blocks which, you know, just is kind of a random  
13 nature almost.

14 But I think that most of the studies that I  
15 have seen have been fairly consistent that the  
16 filter bandwidths are very viable in 1.9 gigahertz  
17 and do impact significantly on the ability to  
18 share.

19 MR. STANLEY: Particularly in the  
20 allocations?

21 MR. ROSENBLATT: Yeah.

22 MR. STANLEY: Limond, please.

1           MR. GRINDSTAFF: I would like to comment on  
2   that. We have done extensive work for the last  
3   three years and the feasibility of spectrum  
4   sharing -- computer modeling and spectrum sharing,  
5   and nationally deploying a PCS full-service  
6   system, a PCS 1900 system, in downtown  
7   San Francisco in the spectrum sharing environment,  
8   and I concur with Jeff that the bandwidth filters  
9   are extremely wide. Some going 20 megahertz.  
10   Even some higher than that.

11           There's three issues that confront spectrum  
12   sharing. One is if you look at the number of  
13   links and you look at their split, that they're  
14   not evenly or equally split. They've done a  
15   hodgepodge of duplexing throughout the  
16   bandwidths.

17           The other one -- and this chart kind of  
18   shows it -- is that if I'm a PCS provider No. 1  
19   and this is my link, I remove that link and I'm  
20   clear to operate. If there's a microlink that  
21   spans over two PCS bands, then that link affects  
22   both PCS operators. And then you would have the

1 wideband PCS or microwave filter that sits in PCS  
2 operators 2 but bleeds over into PCS operator 1.  
3 So is issue of spectrum sharing gets more  
4 complicated.

5           The reality of the situation is spectrum  
6 sharing is not an issue; that from our studies in  
7 deploying the system in San Francisco we took 140  
8 megahertz and we were able to get 12 channels to  
9 operate the system. And the other thing that has  
10 to be considered when you look at microwave links  
11 and spectrum sharing is that so far I've seen all  
12 the studies, including ours; we've always looked  
13 at the street level plane.

14           In our August 1991 FCC progress report we  
15 did measurements in a multistory building that  
16 showed the effects of a microwave link when the  
17 user goes from the ground floor to the 10th floor  
18 and there's up to a 30 DB gain an hour from the  
19 microwave receive filter, or receive power. What  
20 this means is that when you deploy a PCS system,  
21 if you can control your users and keep them where  
22 you want them, it's great. But once the users

1 start roaming and start moving around, sharing  
2 spectrum does not work.

3 So when the issues come up about 40  
4 megahertz, 20 megahertz and 10 megahertz, it's  
5 irrelevant. You need to move the microwave users  
6 out, and the FCC has taken steps to do that.  
7 Putting the limits on how long a microwave user  
8 can be in service puts those limits on that.

9 The last obstacle was the unlicensed band  
10 or the public safety users, and in my opinion  
11 those are probably the easiest people to move out  
12 because they could use new equipment. From our  
13 discussions with them and our practical experience  
14 with them, they have approached us in  
15 San Francisco wanting to sell their links to us,  
16 and we keep telling them wait until we buy a  
17 license and -- (inaudible)

18 MR. STANLEY: Okay, Chuck, you wanted to  
19 comment.

20 MR. JACKSON: Well, just an observation on  
21 this thing. One of the issues on the kind of  
22 service is the speed with which you can move out

1 the incumbents, and it strikes me as sort of a  
2 tentative idea and I just got to thinking here.  
3 Maybe there are things that the Commission can do  
4 in its rules that will speed the process of  
5 agreement between the new PCS licensees and the  
6 microwave incumbent.

7 One idea that comes to mind is to set a  
8 ceiling on any excessive payment over the cost of  
9 relocation; a ceiling which would not come into  
10 effect until, say, 12 months have gone by.

11 One of the well-known things about  
12 negotiation is that what determines a position's  
13 behavior is their best alternative to a negotiated  
14 agreement. And if you had a rule that said after  
15 12 months the excess payment can only be 50  
16 percent of the cost of the microwave system, it  
17 might focus the parties, particularly the  
18 part -- the incumbent who might be -- who is  
19 reluctant to relocate since it's sort of a status  
20 quo situation and they might get more later. It  
21 might focus them on agreement in the short run.

22 It's just a tentative idea I throw out. I

1 haven't really thought it around. But it seems to  
2 me it's one way the Commission could act to speed  
3 things up.

4 MR. STANLEY: We certainly picked up the  
5 spirit of that in our tax certificate session.

6 Again, let me ask Jeff to respond on the  
7 following area: Although you painted somewhat of  
8 a pessimistic picture in terms of bandwidth, you  
9 actually suggested that the situation above 2110  
10 may not be so negative with regard to, say, either  
11 relocation and/or coexistence because of the, say,  
12 the bandwidths and relative, say, age or class of  
13 the equipment. Could you elaborate?

14 MR. ROSENBLATT: I would -- I agree with  
15 half that statement. What I said was that in  
16 terms of coexistence -- and in this area I tend to  
17 agree somewhat with what Limond mentioned; that  
18 we're not really talking about sharing in kind of  
19 the early senses of that analysis or that -- early  
20 to PCS where everybody was thinking that we could  
21 just coexist within the same market without any  
22 problems. And I think right now we're talking

1     about frequency avoidance in having to avoid  
2     particular microwave receivers.

3             In that case, that 2.1 gigahertz, you'll be  
4     better off in that the microwave filters are much  
5     narrower. And just in general a particular  
6     microwave receiver might take up 2 megahertz, plus  
7     or minus 2 megahertz -- well, 2 megahertz high, 2  
8     megahertz low, out of your 10 megahertz allocation  
9     as opposed to a 20 megahertz allocation of 1.9  
10    where one microwave receiver tends to occupy the  
11    whole thing.

12            However, in terms of relocation, you've got  
13    a worse situation, because you've got more  
14    microwave receivers and less bandwidth so you've  
15    got more links to move out, more time involved,  
16    more complexity negotiations and so on and so  
17    forth.

18            So half of that is true.

19            MR. GRINDSTAFF: Let me add one more  
20    comment to that.

21            MR. STANLEY: Sure.

22            MR. GRINDSTAFF: When you look at -- when

1     you talk about relocating the microwave users and  
2     moving up the 6 gig, not all of them have to move  
3     to 6 gig. We have instances in San Francisco  
4     where there are links that are less than two miles  
5     long and they're using 2 gig. We take film  
6     measurements of it, and one of the comments is  
7     wondering why haven't their front end receivers  
8     burnt out on their microwave links because they're  
9     so hot.

10            So there are multiple spectrums that can be  
11     used to relocate these links. And I think also  
12     the PCS operator, when you talked about trying to  
13     market it, and he builds his network out, will be  
14     negotiating and moving these links out. And it's  
15     to the advantage of the microwave user eventually  
16     to get out of the way because I won't be able to  
17     control my PCS users and the band will get so  
18     cluttered that the interference between the PCS  
19     user and microwave will become more and more  
20     prevalent.

21            And so I think it will work in the initial  
22     stages, working to clear the spectrum out. And as



1 the PCS service rolls out into the suburban and  
2 rural areas, then those links will be knocked  
3 out. You don't have to go out and clear  
4 everything in the band day one.

5 MR. HALLER: Okay. Jeff, can I ask you one  
6 other question about the upper band?

7 It's my understanding that there's another  
8 factor, and that is the antenna game, and in the  
9 lower band that the links have very broad beam  
10 widths and, therefore, a particular link may cover  
11 a huge portion of a city, whereas we have more  
12 beams in the upper band and, therefore, it would  
13 be easier to avoid those links not only because of  
14 bandwidth but because the energy is simply not  
15 spread over as much of the geographical area. Do  
16 you agree with that as a premise?

17 MR. ROSENBLATT: Well, I would agree with  
18 that in terms of the 1.9 gigahertz band versus the  
19 6 gigahertz band. But between 1.9 and 2.1 I would  
20 think that there's a negligible difference.

21 MR. HALLER: Well, it's my understanding  
22 that our antenna requirements are much more

1 stringent in the 2.3 gigahertz band than in the  
2 1.8, and that in itself would be a mitigating  
3 factor.

4 MR. ROSENBLATT: I don't think that they're  
5 that much different. Between 1.9 gigahertz and  
6 2.1 gigahertz, the designation for Standard A, it  
7 might be a few DB different here and there but I  
8 don't think it's really that much.

9 MR. FELKER: And actually, Ralph, there may  
10 be more grandfathered periscope antennas in the  
11 lower sub-band which I think might account for,  
12 you know, where you're coming from but in terms of  
13 standards, I think you're --

14 MR. ROSENBLATT: In fact, you know, you're  
15 probably going to see more of a high-performance  
16 antenna -- you know, in the category of  
17 high-performance or ultra high-performance  
18 antennas at 1.9 gigahertz because it's more  
19 congested in terms of the bandwidth that they  
20 occupy. There's not that many channels available  
21 than the 2.1 where there's -- even though there's  
22 less spectrum, there are more channels to choose

1 from.

2 MR. HALLER: Well, then let me go ahead and  
3 ask the question I really wanted to ask.

4 MR. ROSENBLATT: Okay, go ahead.

5 MR. HALLER: And that is in your analysis  
6 of what it would take to clear these, has the  
7 actual antenna game in being considered -- or have  
8 you considered this frequency is in use in this  
9 town and, therefore, it's going to be cleared?

10 MR. ROSENBLATT: Yeah, we have done fairly  
11 extensive modeling, and I think that Limond has  
12 also done some fairly extensive modeling in terms  
13 of the spectrum utilization in cities which takes  
14 into account in some cases measured data in  
15 addition to the antennas and microwave filters.

16 So all of those factors taken into account  
17 show that you can coexist, although as Limond  
18 points out, in some major markets like  
19 San Francisco in the downtown area that he was  
20 looking in, you're only going to find a few  
21 megahertz available. But he was able to find a  
22 few megahertz. In other cities that aren't

1 necessarily as concentrated or as occupied, that  
2 number tends to increase.

3 And I believe, also, that the several  
4 megahertz wasn't necessarily in a 30 megahertz  
5 block. I think that was over the whole 1.9  
6 gigahertz band, in that case. That would be an  
7 extreme case. However, it does indicate that  
8 there can be some form of coexistence.

9 MR. STANLEY: Thank you. Let me bring up a  
10 separate subject now of standards. Yesterday  
11 the -- and let's call it the views of the  
12 economists were fairly strong on what I'll the  
13 rising tide of the demand, pushing very strongly  
14 for the development of PCS, and in this kind of  
15 arena something like standards may not be exactly  
16 the first thing you specify.

17 What's your general reaction to that? I  
18 guess you've all addressed that in a way in your  
19 own words, but let me, I guess, start with you  
20 John, in the area of standards that you had  
21 dwelled on. You had one standard, no standards, I  
22 guess pretty much the flexibility. Could you

1     respond.

2             MR. BATTIN: Well, part of our proposal was  
3     that the Commission required that the industry  
4     operate the systems according to standardized  
5     protocol. We think that will help in a number of  
6     different ways.

7             MR. STANLEY: Let me make sure I understand  
8     what that means. Is that an air-interface  
9     standard or is it something stronger?

10            MR. BATTIN: I think it's multiple  
11     air-interface standards. You know, we believe  
12     that the PCS requirements are too broad to be  
13     served by one air-interface but yet if the FCC  
14     requires that all systems that go on the air and  
15     PCS frequencies operate according to a  
16     standardized air-interface, that would be a very  
17     reasonable middle of the road that will force  
18     industry -- it can force industry to very quickly  
19     come up with standards.

20            I mean, the thing that will drive standards  
21     is the fact that we know as Motorola and all of  
22     our competitors know that if there are no

1 standards, we can't sell anything. As long as we  
2 don't need a standard, then if we're in a  
3 committee, we're negotiating with AT&T or Erickson  
4 or something and we know that if we don't come to  
5 an agreement, you know, too bad; we have our six  
6 customers, they have their six, we'll go off and  
7 do our own thing. But if, in fact, we know that  
8 we have to come to an agreement before we can sell  
9 anything, you know, guess what, we come to an  
10 agreement.

11 And so I think when the FCC says, hey,  
12 industry, you have to make up your mind; we don't  
13 care whether it's two, three, four, five, six  
14 standards, but you'd better make up your mind and  
15 have standardized air-interfaces or we won't type  
16 or group your equipment, we'll go get that job  
17 done. And I think that we've proven in the past  
18 that we will.

19 MR. STANLEY: As I recall there were, what,  
20 something like 17 candidates air-interface  
21 standards initially in some of the community  
22 groups. That's been dwindled down to eight and

1     now I hear four. I mean, isn't that enough --  
2     isn't the process working without the good offices  
3     of the FCC?

4             MR. BATTIN: There is a contention that  
5     says that this process may have a sign wave to it,  
6     you know, to where you get it dwindled down to  
7     four or five and you think you can get along with  
8     your neighbor, but then when you finally get down  
9     to debate the last microbolt, then they diverge  
10    again.

11            MR. STANLEY: What are the benefits of  
12    really the Commission suggesting that it would  
13    only approve equipment that goes -- is in a sense,  
14    passed through ANSI equivalency? I guess ANSI  
15    approves standard-setting processes. What's  
16    really the advantage to the public of that  
17    particular requirement?

18            MR. BATTIN: I think, first of all, it  
19    assures that there are going to be multiple  
20    vendors. It assures that some of the  
21    characteristics that have made cellular successful  
22    will happen on PCS. You know, that Motorola can

1     make a subscriber unit and pretty much garner to  
2     the user that it will work in Boston, it will work  
3     in Seattle, it will work in Dallas; that there's  
4     not a lot of hidden standards underneath. We're  
5     involved in a couple of systems on a worldwide  
6     basis that, yes, we beat the rudiments of the  
7     air-interface, but if you push button No. 1 on an  
8     Erickson phone, it means different things in the  
9     system than No. 1 on a Motorola or a No. 1 on a  
10    Nokia or No. 1 on a Mashoosta.

11           So even though it may look like you all  
12    have TDMA or it may look like you all have CDMA,  
13    when it gets down to it, you still don't have the  
14    ability for the user to shop end product with some  
15    kind of assurance that all the product is going to  
16    work.

17           MR. FELKER: Well, I just -- as you may  
18    know, Tom, when I worked on the Commission, I was  
19    the enemy of form-line standards setting, by the  
20    agency anyway.

21           MR. STANLEY: Let the record show that Lex  
22    is the enemy and --



1           MR. FELKER: I'm speaking past tense. And,  
2   you know, for all the reasons that John and others  
3   have cited, you know, delay and retarding  
4   innovation and giving incumbents a leg up over  
5   newcomers, and things like that. But now as a  
6   perspective operator, you know, clearly we're  
7   interested in things as mundane as  
8   interoperability. We're clearly interested in  
9   achieving whatever scale economies may be  
10  possible.

11           In a competitive market obviously those  
12  economies will flow to the subscribers, and it  
13  strikes me that the proposal that Motorola has  
14  offered where the Commission doesn't bless a  
15  particular standard but rather a process which  
16  produces, perhaps, multiple standards, is not a  
17  bad one and it probably is deserving of some  
18  thought.

19           I guess, again, the only issue that I would  
20  raise is what does -- does <sup>5</sup>this process adequately  
21  address the delay issue. John, in the example he  
22  just presented, suggests that, yeah, this is the